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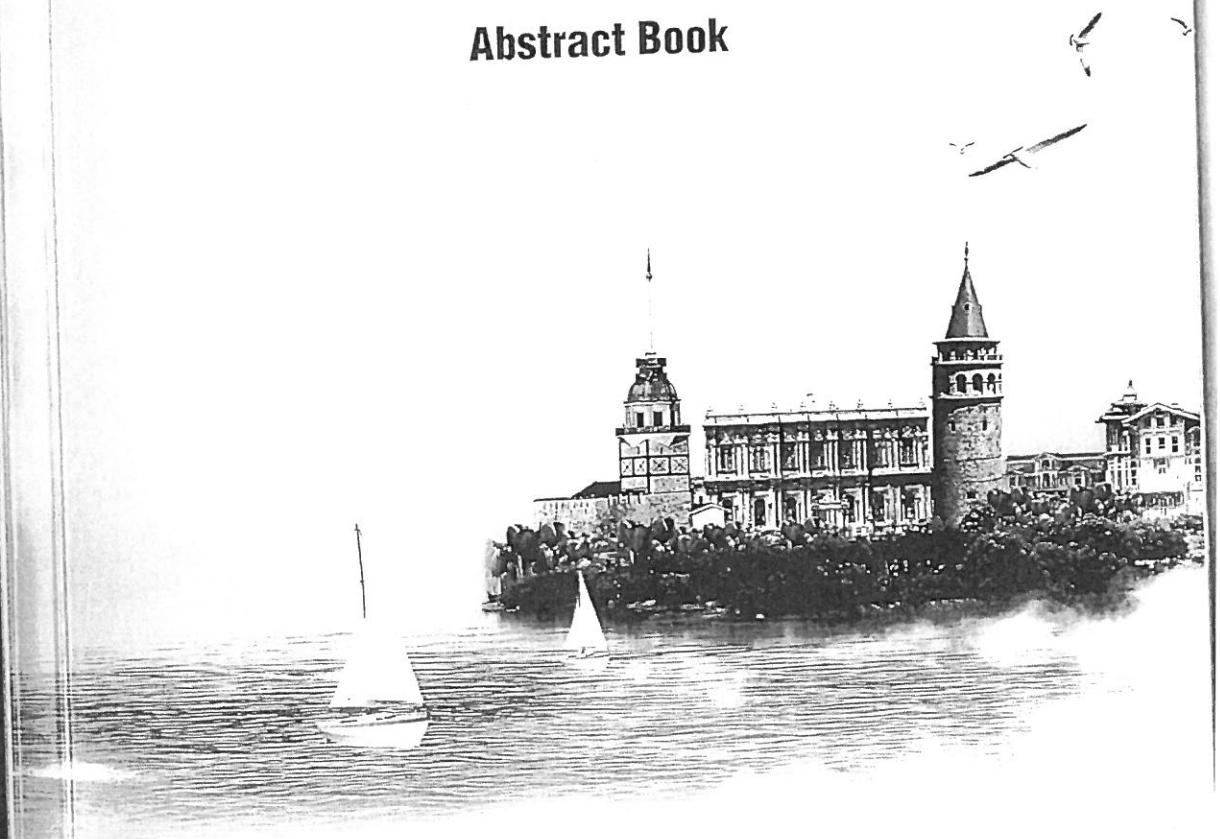

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Isolation and characterization of antifungal dairy propionibacteria

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Spoilage of stored food caused by food-borne fungi is a huge problem in the food industry and can result in significant economic losses. In addition, fungi can cause severe health problems due to the production of mycotoxins by some moulds. The use of biopreservation to control food-borne fungi has gained increased interest due to consumers' requirements for reduced use of chemical preservatives. Propionibacteria are important organisms in specific food fermentations such as certain cheeses and other dairy products and some strains can in addition be used as biopreservatives due to their antimicrobial nature. The mechanism behind the antifungal activity of these organisms is not yet fully elucidated but a synergistic effect between produced antifungal metabolites is indicated as a likely explanation. Strains of dairy propionibacteria were isolated from Swiss raw milk Emmental cheeses and identified by the use of Rep-PCR, PFGE and 16S rDNA sequencing. Three restriction endonucleases were studied for their digestion of the isolated propionibacteria. The antifungal activity of the propionibacteria was tested against indicator yeasts and moulds isolated from foods with an overlay assay. Some of the propionibacteria displayed a marked inhibitory effect against moulds, whereas no or limited inhibition was seen against the indicator yeasts. Propionibacteria showing high anti-mould activity were selected for further analysis. The antifungal activity was highly influenced by the carbon source in the growth media, with the highest activity observed in media with the lowest end pH. An increase in incubation time of propionibacteria from 3 to 8 days prior to inhibition tests increased antifungal activity. However, although activity could still be observed after 17 days of incubation, some of the antifungal effect was lost after prolonged incubation time of propionibacteria and moulds. The nature of the antifungal metabolites was studied in order to clarify the mechanism behind the antifungal activity of the isolated propionibacteria.